QA2 - Use of Vitamins in Children with Down Syndrome

Question

A Down Syndrome five month old breastfed infant is given supplemental Nutrivene D and 90 cc Nutramigen formula. The Nutramigen and Nurtrivene D, a powder dissolved in white grape juice, are given via the lactation device at bedtime. The child is thriving on breast feedings and receives Early Intervention Services at the local neuromuscular center.

The mother and PHN asked me to analyze the formulation. The percentage of RDA for infants 0 to .5 years are as follows: Vitamin A (from beta carotene and palmitate) 72%, Vitamin D 5%, Vitamin E 933%, Folic Acid 672%, Niacin 520%, Thiamin 3800%, Vitamin B12 6300%, Riboflavin 2400%, Vitamin B6 2500%, Vitamin C 700%, Selenium 95%, and Zinc 42%. What are some issues with such extremely high doses of vitamins (B vitamins particularly) in such a young infant? What tests are recommended to monitor for excess amounts?

ANSWER:

Nutrivene D is a part of the "TNI" (Targeted Nutrition Intervention) supplements, currently promoted for children with Down Syndrome. The following is the assessment of the vitamins given to this infant:

Vitamin E: 28 mg (933%RDA for infants 0-6mos.)----studies in adults given 100 to 800 mg/day (1000-8000% RDA) showed no toxicity symptoms.[1]

Folate: 168mcg (672%RDA for infants 0-6 months)---levels of 10,000% RDA given parentarally to lab animals caused kidney damage. In 1979, Colman and Herbert found that 10,000% RDA or more may precipitate convulsions in persons whose epilepsy is in continuous control by phenytoin (Dilantin). In 1988, Butterworth et al found no deleterious effects in women taking 10 mg/day (2500%RDA) folate for four months. [1]

Niacin: 26mg (520% RDA for infants 0-6 months----Very large amounts of Niacin (3000 to 9000mg) were found to result in various metabolic effects: increased utilization of muscle glycogen stores, decreased serum lipids and decreased mobilization of fatty acids from adipose tissue during exercise (study by Darby et al, 1975). [1]

Thiamin: 11.4mg (3800% RDA for infants 0-6 months)---A study in 1954 found no evidence of toxicity from oral doses of 500mg given to adults (33,333% of RDA). [1]

Vitamin B12: 18.9 mcg (6300% RDA) ---No toxicity has been found, even in very high levels (10,000X RDA) given to adults. [2]

Riboflavin: 9.6mg (2400% RDA)---No toxicity has been found. 1000mg/lb body weight given to lab animals caused no ill effects. [1]

Vitamin B6: 7.5mg (2500% RDA for infants 0-6 months)---Neurologic abnormalities have been found in women given an average of 117mg +/- 92 mg for >6 mos to >5 years. In all cases symptoms resolved within 6 months of discontinuation of supplements (Dalton and Dalton 1987). [1]

Vitamin C: 210mg (700% RDA for infants 0-6 months old)---Adverse effects in adults have not been reported with intakes less than 1000mg/day (1600X RDA). Many people take >1000mg/day without problems, however, very large doses are not recommended. [1]

From the above information, we can conclude that there is no known danger in giving these large amounts of water soluble vitamins to an infant. Also, excess water-soluble vitamins are usually excreted, and side effects usually require larger doses than in this supplement. However, studies on these high levels of vitamins have not been done in infants or children and adverse effects may occur. If high levels of fat-soluble vitamins were given, it would be important to obtain serum levels.

A 5 month old, thriving, breastfed infant does not require a multivitamin supplement. The two nutrients one might be concerned with are: iron and vitamin D, both low in breast milk. This infant is supplemented with a small amount of Nutramigen, but that would not meet iron and Vitamin D needs. If parents are adamant about giving a supplement, an infant multivitamin would be appropriate.

Although Nutrivene D and "TNI" (Targeted Nutrition Intervention) supplements are promoted for children with Down Syndrome, there is no scientific evidence to show benefits. All reports have been anecdotal and no double-blind controlled studies have been done to date. However, it has been publicized and promoted in the popular press, including national television programs and the internet.

Parents of children with disabilities, such as Down Syndrome, are vulnerable to promotions for nutritional regimens/supplements which promise improved health and mental development. There have been many such promotions over the years. In 1981, Harrel et al published a study on megavitamin supplementation of children with mental retardation in the National Proceedings of Science (a non-peer reviewed journal). The authors claimed that the children who had Down syndrome had increases in IQ, as well as improved school performance, etc. The study was not double blind; but it hit the national media and became very popular with families. As a result, several national pediatric centers replicated the study, using controlled double-blind methods. In all repeat studies, the results were negative in all areas assessed (IQ, school performance, speech and language development, growth, and dietary intake). [3]

In conclusion, we need to be careful to counsel parents on what they can do to promote optimum health and development in their children (i.e. balance diet, appropriate advancement to solid foods, exercise, physical and speech therapy when needed). When

parents think that some supplement will improve or “cure” their child, they may not continue interventions that can really make a difference.

References:

1) National Research Council, Recommended Dietary Allowances, 10th edition, National Academy Press, Washington D.C. 1989 pp115-165.
2) Marshall, C.W., Vitamins and Minerals Help or Harm? J.P. Lippincott Co. Philadelphia, 1983 pp99-100.
3) Ekvall, SW: Pediatric Nutrition in Chronic Diseases and Developmental Disorders. Oxford Press, 1993, pp149-156.